

**SUPPLEMENTARY COMMENTS OF RECOMMUNITY, INC.
TO THE
SCIENTIFIC ADVISORY BOARD BIOGENIC CARBON EMISSIONS PANEL
FOR ITS REVIEW OF THE ENVIRONMENTAL PROTECTION AGENCY
DRAFT BIOGENIC CARBON DIOXIDE EMISSIONS ACCOUNTING FRAMEWORK**

May 18, 2012

ReCommunity, Inc. is submitting these supplementary comments to the Scientific Advisory Board (SAB) Biogenic Carbon Emissions (BCE) Panel regarding its advisory report to the Environmental Protection Agency (EPA) on the draft Accounting Framework for Biogenic Carbon Dioxide Emissions (Accounting Framework). On March 16, 2012, ReCommunity submitted written and oral comments for the March 20, 2012 teleconference of the BCE Panel.¹ Those comments described the company's ReEngineered Feedstock™ and urged the BCE Panel to recommend a simple, straightforward methodology for fuels such as ReEngineered Feedstock that would treat carbon dioxide emissions as carbon neutral; for example, by assigning a biogenic accounting factor (BAF) of zero (0) to the fuel.

ReCommunity thanks the BCE Panel for including language in its latest draft report along these lines. For example, the BCE Panel states:

For materials diverted from the waste stream, consider their alternate fate, whether they might decompose over a long period of time, whether they would be deposited in anaerobic landfills, whether they are diverted from recycling and reuse, etc. For municipal solid waste, consider the mix of biogenic and fossil carbon when waste is combusted. For feedstocks that are found to have relatively minor impacts, the Agency may need to weigh ease of implementation against scientific accuracy. After calculating decay rates and considering alternate fates, the Agency may wish to declare certain categories of feedstocks with relatively low impacts as having a very low BAF or setting it to 0.²

ReCommunity agrees that there are categories of feedstocks – ReEngineered Feedstock being one – with such low impacts, indeed with net environmental benefits, that they should be declared to have a BAF of 0. We also agree that, for such feedstocks, ease of implementation should be heavily weighted against exact scientific accuracy.

¹ Comments of ReCommunity, Inc. to the Scientific Advisory Board Biogenic Carbon Emissions Panel for Its Review of the Environmental Protection Agency Draft Biogenic Carbon Dioxide Emissions Accounting Framework, March 16, 2012 [hereinafter March 16 comments], [http://yosemite.epa.gov/sab/SABPRODUCT.NSF/0DD4CF7991D05BE7852579C6004C41FA/\\$File/ReCommunityCommentsBiogenicCO203162012.pdf](http://yosemite.epa.gov/sab/SABPRODUCT.NSF/0DD4CF7991D05BE7852579C6004C41FA/$File/ReCommunityCommentsBiogenicCO203162012.pdf).

² 5-9-12 DELIBERATIVE DRAFT report of the Biogenic Carbon Emissions Panel [hereinafter 5-9 Draft BCE Panel Report], at 7, [http://yosemite.epa.gov/sab/SABPRODUCT.NSF/ea5d9a9b55cc319285256cbd005a472e/6c7f591ce62504fd852579f900619dbb/\\$FILE/5-9-12%20Advisory_Clean%20Copy.pdf](http://yosemite.epa.gov/sab/SABPRODUCT.NSF/ea5d9a9b55cc319285256cbd005a472e/6c7f591ce62504fd852579f900619dbb/$FILE/5-9-12%20Advisory_Clean%20Copy.pdf).

The draft BCE Panel report also states:

Case studies could be developed to assess and develop a list of feedstocks or applications that could be excluded from accounting requirements as “anyway” emissions. A sensitivity analysis using case studies could be used to develop reasonable offset adjustment factors if they are needed to adjust anyway feedstocks for impact on long term stocks like soil if needed.³

ReCommunity applauds the concept of feedstock-specific case studies as a potentially simple and straightforward manner of addressing unique, “out-of-the-box” feedstocks such as ReEngineered Feedstock. For the reasons given in the March 16 comments and herein, carbon dioxide (CO₂) emissions from the biogenic portion of ReEngineered Feedstock clearly are anyway emissions – in fact, the ReEngineered Feedstock manufacturing process ensures that carbon-based emissions from the combustible portion of wastes are minimized, and it ensures that the emissions that do occur are CO₂ rather than methane (CH₄), with its higher global warming potential. Because the default pathway for waste carbon is decomposition in a landfill or incineration, there is no need to develop an offset adjustment for impact on long-term stocks.

The comments herein address these points, further describe the ReEngineered Feedstock process and its benefits, and address questions raised by the BCE Panel on the March 20 teleconference. We also provide a hypothetical example to demonstrate the reduction in greenhouse gas (GHG) emissions that ReEngineered Feedstock provides over a business-as-usual landfilling scenario that includes methane capture. Because of these GHG reductions and the many other benefits provided by ReEngineered Feedstock (including increased recycling and air contaminant reductions), ReCommunity believes that it qualifies as a feedstock that should be assigned a BAF of 0.

I. CARBON DIOXIDE EMISSIONS FROM ReENGINEERED FEEDSTOCK ARE ANYWAY EMISSIONS BECAUSE RECYCLABLE MATERIALS ARE SEPARATED FROM THE WASTE PRIOR TO SELECTING MATERIALS FOR ReENGINEERED FEEDSTOCK PRODUCTION

As explained in the March 16 comments, ReEngineered Feedstock is produced from biogenic fibers and plastics recovered from municipal solid waste (MSW) or from commercial or industrial waste, to which virgin sorbents are added. ReCommunity asserted that CO₂ emissions from combustion of ReEngineered Feedstock are “anyway” emissions, because the material, if not combusted as ReEngineered Feedstock, would have decomposed to CO₂ and CH₄ in a landfill. The BCE Panel questioned whether this was really the case, given that much of MSW and other waste can be recycled. In fact, one of the great benefits of the ReEngineered Feedstock process is that all marketable recyclables are separated out and sold in the commodity markets, with only otherwise non-marketable materials used to make the Feedstock. Indeed, ReEngineered Feedstock was developed as an outgrowth of ReCommunity’s core mission: recycling. ReCommunity is the largest independent, pure play recycling and recovery business in North America. The company does not own a single landfill and, as a result, makes money

³ 5-9 Draft BCE Panel Report at 40.

only from the waste materials it succeeds in reusing or recycling. Once ReCommunity had fully optimized its recycling processes, it developed ReEngineered Feedstock as a means of beneficially using the energy in the non-recyclable MSW as an alternative to landfilling that material.

The carbon content used to manufacture ReEngineered Feedstock is otherwise destined for landfilling or incineration.⁴ ReCommunity's advanced materials characterization, separation, and manufacturing technology utilizes and diverts the incoming MSW and other mixed-waste streams in the most sustainable and energy efficient way possible. As discussed in detail in the March 16 comments, ReCommunity's advanced Multi-Material Processing Platform (MMPP) characterizes and separates all marketable recyclables. Only after all recyclable materials are removed from the incoming MSW and mixed waste is ReEngineered Feedstock manufactured from discrete, specifically selected fibers and plastics.

Thus, the ReEngineered Feedstock production process ensures that the carbon content of the Feedstock is being put to its highest and best use. That carbon content, if not made into ReEngineered Feedstock, would otherwise have been landfilled and decomposed into CO₂ and CH₄. Alternately, it would have been incinerated and converted to CO₂. Therefore, CO₂ emissions from combustion of ReEngineered Feedstock are anyway emissions. In fact, to the extent the carbon would have been converted to methane in a landfill, the ReEngineered Feedstock emissions constitute a net reduction in CO₂ equivalents (CO₂e).⁵

Further, the ReEngineered Feedstock process provides for greater sequestration of carbon in recycled materials than does business-as-usual recycling. Because the advanced technology used for ReEngineered Feedstock provides for highly efficient removal of all marketable recyclables, the process leading to production of ReEngineered Feedstock keeps a greater amount of waste carbon sequestered in product materials.

A. All Marketable Recyclable Materials Are Characterized and Separated From the Waste Stream and Sold on Commodity Markets Prior to the Manufacturing of ReEngineered Feedstock

As stated above, ReCommunity's innovative and advanced process, MMPP, maximizes recycling. ReCommunity's dedication to increased recycling means that none of the biogenic content in the waste materials that could be put to better use (*i.e.*, recycled and reused) is combusted. Table 1 provides a partial list of recyclable materials removed from the incoming waste stream by the MMPP process. Only after all commercially recyclable materials are removed are the constituent ingredients of ReEngineered Feedstock – biogenic fibers and hard and soft plastics – selected and removed from the remaining waste.

To achieve the maximum level of recycling, the MMPP characterizes and separates the incoming waste using a variety of technologies, some of which are available on the market and some of which are proprietary. These technologies include optical sorting, drum separation,

⁴ Landfilling is the primary default destination; on a national basis approximately 10% of MSW is incinerated GHG. *See* note 10 below.

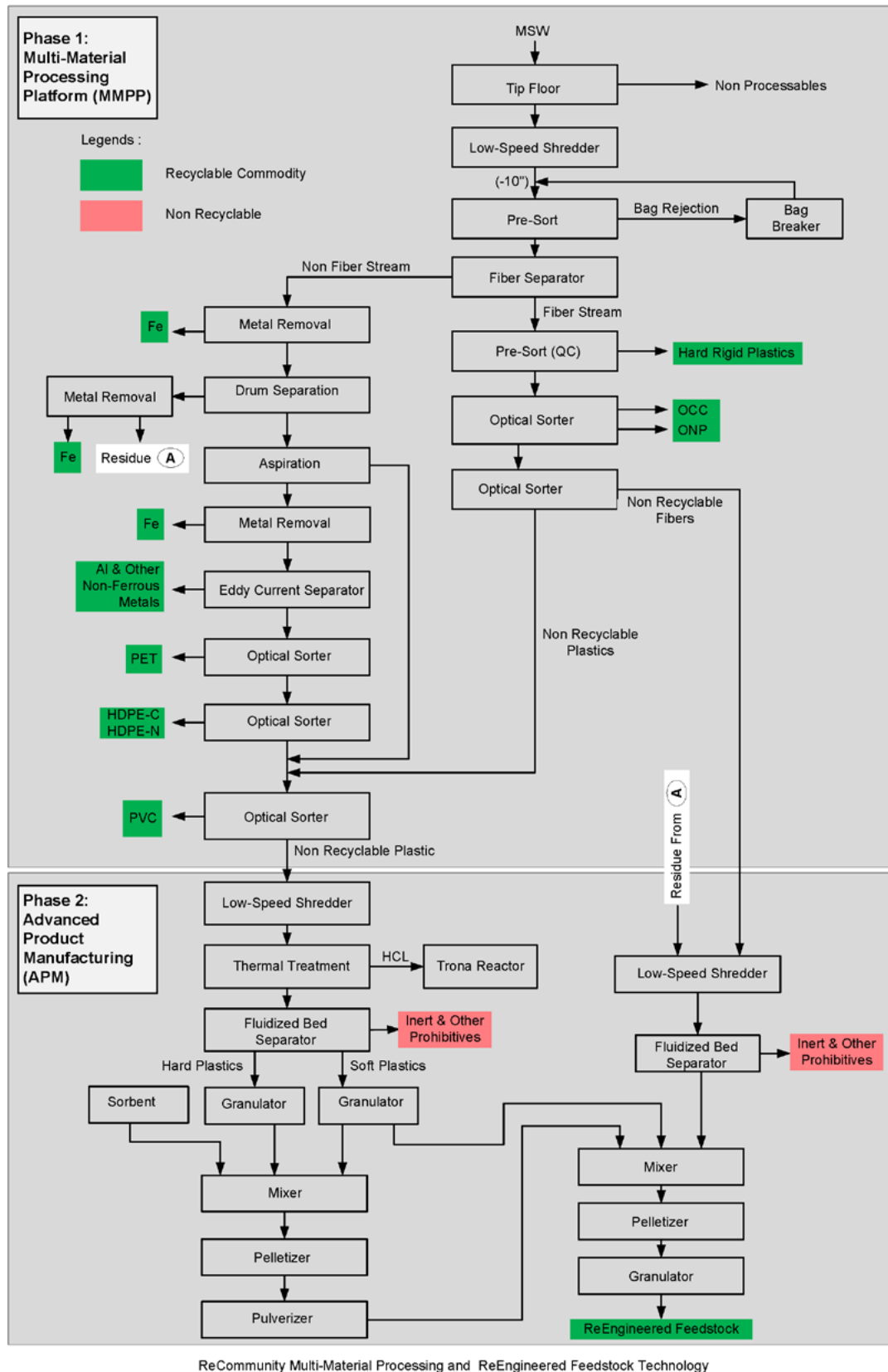
⁵ See Section III, below, for more discussion of potential methane emissions.

magnetic separation, eddy current separation, and fluidized bed separation. The optical sorting station can be calibrated to differentiate between different types of plastics, *e.g.* PET, PVC, HDPE, high-density polystyrene, and other plastics such as polystyrene foam peanuts. Fluidized bed separation removes all nonconforming particles (*e.g.*, heavy inerts and non-combustibles) and any microscopic metal fragments attached to the plastics that are too small for magnetic or eddy current separation. The end result of the MMPP is that the incoming waste is characterized, separated, and segregated at a highly-specific level. ReCommunity conducts mass balance (also known as material balance) testing to ensure that the percentages of the incoming waste stream that are recycled, manufactured into ReEngineered Feedstock, and landfilled are accurate. Through this mass balance, ReCommunity is able to ensure that ReEngineered Feedstock contains only *de minimis* amounts of commodity recyclable material.

Marketable Recyclables Separated from Waste by MMPP
<ul style="list-style-type: none"> • Paper Products <ul style="list-style-type: none"> ○ Cardboard ○ Old corrugated cardboard ○ Old newspapers • Plastics <ul style="list-style-type: none"> ○ Polyethylene Terephthalate (PET) ○ High Density Polyethylene (HDPE) ○ Low Density Polyethylene (LDPE) ○ Polyvinyl Chloride (PVC) • Metals <ul style="list-style-type: none"> ○ Aluminum ○ Ferrous metals ○ Non-ferrous metals • Aseptic packaging • Glass

Table 1

Figure 1 is a schematic of the MMPP. The schematic also illustrates the Advanced Manufacturing Process (AMP) used to make the ReEngineered Feedstock from selected constituents separated out by the MMPP. ReCommunity’s technology converts the non-recyclable materials that normally would be landfilled into a useful energy source. This, on one side, significantly reduces landfill GHG emissions (primarily methane), and on the other side, simultaneously reduces GHG emissions by replacing fossil fuels. For further detail on the MMPP and AMP processes, see the March 16 comments, pages 3 to 9 and Appendix A.



ReCommunity Multi-Material Processing and ReEngineered Feedstock Technology

Figure 1. The ReEngineered Feedstock Process

B. The ReEngineered Feedstock Process Increases Carbon Sequestration in Products Relative to Normal Recycling

ReCommunity's ReEngineered Feedstock process increases the depth and breadth of recycling in two ways. First, the state-of-the-art MMPP process described above ensures that all materials that can be commercially recycled are so recycled. Relative to typical MSW recycling operations, a greater amount of carbonaceous material (paper, plastic, etc.) is recycled, thus sequestering the carbon for the useful life of that material.

Second, ReCommunity's technology can be applied to waste streams that have been challenging for traditional recycling to access, including the commercial, industrial, and institutional waste streams. Thus, carbon content of such wastes that normally would be landfilled or incinerated is instead recovered as marketable recycled material. Again, the carbon content of that material is sequestered for its useable life, rather than decomposing to CO₂ and CH₄ or being combusted to CO₂.

Thus, compared to the business-as-usual scenario, ReEngineered Feedstock not only is using only carbon that otherwise would be disposed of, it also is increasing the amount of carbon that is retained in a sequestered state, due to recycling.

For these reasons, the CO₂ emissions from ReEngineered Feedstock combustion not only are "anyway" emissions, but in fact are lower than "anyway" emissions.

II. CARBON EMISSION ACCOUNTING FOR ReENGINEERED FEEDSTOCK SHOULD BE RELATIVE TO THE DEFAULT PATHWAY OF LANDFILLING

As noted above, the current draft of the BCE Panel Report suggests that case studies could be developed for specific feedstocks, and that "[a] sensitivity analysis using case studies could be used to develop reasonable offset adjustment factors if they are needed to adjust anyway feedstocks for impact on long term stocks like soil if needed."⁶ Such an offset adjustment factor is unnecessary for ReEngineered Feedstock, and in fact would be inappropriate. Unlike woody biomass or agriculture biomass, upstream diversion is not possible for the source materials from which ReEngineered Feedstock draws its constituent plastics and fibers. The default pathway choice for MSW and other mixed waste streams has already been made: If not used to make ReEngineered Feedstock, the non-recyclable portion of the waste would be landfilled or combusted. Thus, the relative environmental benefits of innovative fuels like ReEngineered Feedstock should be calculated based on the benefits of diversion from the landfill, displacement of virgin coal, and energy generation, rather than attempting to factor with respect to the origin of the biogenic content.

The BCE Panel does recognize that the origin of the biomass and the offsite changes in carbon stocks are more important for "long recovery feedstocks" like woody biomass than for wastes.⁷ Indeed, for biogenic fibers removed from MSW, offsite changes in carbon stocks are

⁶ 5-9 Draft BCE Panel Report at 40.

⁷ 5-9 Draft BCE Panel Report at 25.

not relevant because the material was not harvested for energy purposes. The decision to landfill the biogenic content of the waste, rather than to recycle or combust it, would have only the most tangential impact on the decision to create the underlying product in the first place, and as a result, little to no impact on offsite carbon changes. Thus, knowing the waste's origins is neither instructive, nor practically possible. Even if it were possible to ascertain the exact origins of incoming waste, such information would not be relevant to a determination of whether the biogenic content in the waste should be considered carbon neutral. Therefore, a detailed analysis of the origins of the MSW or mixed waste streams used to make ReEngineered Feedstock is not relevant for determining its biogenic accounting factor.

III. THE COMBUSTION OF ReENGINEERED FEEDSTOCK BY POWER PLANTS AND INDUSTRIAL BOILERS WILL CONTRIBUTE TO REDUCTIONS IN GREENHOUSE GAS EMISSIONS OVER AND ABOVE THOSE REDUCTIONS ASSOCIATED WITH CURRENT LANDFILL GAS COLLECTION AND LANDFILL GAS-TO-ENERGY PROJECTS

As the BCE Panel states in its latest draft report, EPA should consider the alternative fate of materials diverted from the waste stream, including such factors as whether those materials might be deposited in anaerobic landfills, when assessing a feedstock's overall impact on greenhouse gas emissions (GHG).⁸ The BCE Panel further recommends that EPA should establish a very low (or zero) BAF for those feedstocks that have relatively minor negative, or perhaps positive, impacts on GHG emissions.⁹ The combustion of ReEngineered Feedstock by coal-fired power plants and industrial boilers will reduce GHG emissions in several important ways, not the least of which is by diverting a substantial portion of MSW from landfills where it would ultimately decompose to produce methane gas. For the reasons discussed below, ReCommunity believes ReEngineered Feedstock is such a low-impact feedstock.

First, ReEngineered Feedstock will reduce the amount of coal and other fossil fuels used by traditional power plants and industrial boilers. That reduction is significant because the fuel content of ReEngineered Feedstock is primarily sourced from biogenic, renewable fibers; unlike the carbon emitted from fossil fuels, the carbon emitted from ReEngineered Feedstock is largely comprised of CO₂ that was recently captured from the atmosphere by plants. Second, combusting ReEngineered Feedstock – which is sourced from MSW, the overwhelming majority of which would otherwise be disposed of in a landfill¹⁰ – will reduce emissions of methane gas (a far more potent greenhouse gas than CO₂) from MSW landfills. In terms of atmospheric input, CH₄ gas from landfills is considered an anthropogenic source of carbon, while the carbon

⁸ 5-9 Draft BCE Panel Report at 40.

⁹ *Id.*

¹⁰ U.S. ENVIRONMENTAL PROTECTION AGENCY, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990 – 2010, 3-38 (April 15, 2012), available at <http://www.epa.gov/climatechange/emissions/downloads12/US-GHG-Inventory-2012-Main-Text.pdf> (hereinafter “GHG Inventory”). While the vast majority of MSW generated in the United States is deposited in landfills, approximately 10 percent of all MSW generated is ultimately incinerated.

dioxide emitted from the same is considered biogenic in origin.¹¹ Although a portion of methane gas produced by landfills may be collected and flared or converted to energy (thus converting the CH₄ to CO₂), those landfills do not capture or collect all of their generated CH₄, and certainly do not use all of it to produce energy. As a result, the combustion of ReEngineered Feedstock by power plants and industrial boilers will contribute to reductions in GHG emissions over and above those reductions associated with current landfill gas (LFG) collection and landfill gas-to-energy projects, and will produce many of the same environmental and economic benefits as such projects.

A. Unlike Landfill Gas-To-Energy Systems, the ReEngineered Feedstock Process Can Provide Immediate Environmental Benefits by Reducing the Quantity of Municipal Solid Waste in Landfills and Harnessing the Energy Potential of that Municipal Solid Waste

According to EPA, landfills represent the third largest source of methane emissions in the United States,¹² accounting for approximately 16 percent of total U.S. anthropogenic CH₄ emissions in 2010¹³ and 4 percent of all U.S. GHG emissions.¹⁴ Emissions from MSW landfills, which receive approximately 69 percent of the total solid waste generated in the United States, account for approximately 94 percent of total landfill emissions, while industrial landfills account for the remainder.¹⁵

Once waste is placed in a landfill, it is first decomposed by aerobic bacteria. After the aerobic bacteria deplete all of the oxygen, the remaining waste is consumed by anaerobic bacteria that break down the organic matter into substances such as cellulose, amino acids, and sugars. Fermentation further breaks those substances down into gases and short-chain organic compounds that form the substrates for the growth of methanogenic (*i.e.*, CH₄-producing) bacteria. The methanogenic anaerobic bacteria further convert the fermentation products into stabilized organic materials and biogas consisting of approximately 50 percent biogenic CO₂ and 50 percent CH₄, by volume.¹⁶ Although methane emissions from landfills depend on a variety of factors, significant CH₄ production typically begins one to two years after waste disposal in a landfill and continues for a period of 10-60 years or longer.¹⁷

Unlike landfill gas capture and landfill-gas-to-energy technologies, which reduce GHG emissions over time by capturing the methane gas produced by a landfill and converting it to less-harmful CO₂, ReEngineered Feedstock guarantees environmental benefits by avoiding

¹¹ PATRICK SULLIVAN, The Importance of Landfill Gas Capture and Utilization in the U.S., 1 (April 6, 2010), available at http://www.seas.columbia.edu/earth/wtert/sofos/Importance_of_LFG_Capture_and_Utilization_in_the_US.pdf.

¹² GHG Inventory at 8-3.

¹³ *Id.* at 8-1.

¹⁴ Sullivan at 2.

¹⁵ GHG Inventory at 8-3.

¹⁶ *Id.*

¹⁷ *Id.*

methane gas emissions altogether. As discussed below, landfills that install LFG capture systems are generally incapable of capturing all of the CH₄ gas they produce (especially during the period when the landfill cell has not been closed, or the collection network has not yet been installed and operated). Furthermore, not all MSW landfills in the United States operate LFG capture technologies; while large MSW landfills are required to collect and combust LFG under federal regulations, small MSW landfills are subject instead only to federal and state incentive programs and do not operate landfill gas capture or landfill gas-to-energy technologies uniformly.¹⁸ As a result, landfills remain a significant source of methane gas emissions in the United States.

Landfills remain the primary method of disposal of MSW in the United States, and there is no indication that this trend will change in the foreseeable future. To the contrary, the estimated annual quantity of waste placed in MSW landfills increased by approximately 20 percent from 1990 to 2010.¹⁹ Moreover, although the amount of landfill gas collected and combusted continues to increase each year, net CH₄ emissions have increased over the past nine years.²⁰ As EPA explains, the reason for this trend is that, given the population growth in the United States, the rate of increase in LFG collection and combustion simply does not exceed the rate of additional CH₄ generation from organic MSW decomposition in landfills.²¹

These statistics illustrate how the combustion of ReEngineered Feedstock can reduce GHG emissions above and beyond LFG capture and gas-to-energy projects. By using MSW as an input, the ReEngineered Feedstock process harnesses the energy potential of the raw materials and allows power plants and industrial boilers to reduce their reliance on fossil fuels, while simultaneously reducing the volume of waste that reaches landfills and ultimately decays to release methane gas into the atmosphere. The benefit of ReEngineered Feedstock in this respect is especially large, because ReCommunity routinely partners with small MSW landfills that are not required to capture and combust LFG under federal regulations, and because, even where methane is captured, as mentioned previously and discussed below, MSW landfills cannot capture and utilize anywhere near 100 percent of their LFG emissions.

B. By Avoiding Methane Emissions, ReEngineered Feedstock Provides Significant Short-Term GHG Benefits

Methane emissions are especially problematic because CH₄ is a GHG with a higher Global Warming Potential (GWP) than CO₂, especially over a short time horizon. A figure often seen is that CH₄ is 21 to 25 times more potent than CO₂. Significantly, this value is for a 100-year timeframe.²² Because CH₄ over time degrades to CO₂ and hydrogen, its potency is duration

¹⁸ See 40 CFR Part 60, Subpart CC (2005); see also 40 CFR Part 60, Subpart WWW (2005).

¹⁹ GHG Inventory at 8-3.

²⁰ *Id.* (although net CH₄ emissions have fluctuated from year to year, the Agency has observed a slowly increasing trend).

²¹ *Id.*

²² See Climate Change 1995, The Science of Climate Change: Summary for Policymakers and Technical Summary of the Working Group I Report, 22 (1995), available at http://unfccc.int/ghg_data/items/3825.php; see also <http://eeocw.org/get-involved/global-warming-potential>.

dependent. Estimates are that CH₄ is anywhere from 56 to 72 times more potent than CO₂ over a period of 20 years.²³ That is, the emission of 1 ton of CH₄ will have the same GWP over a period of 20 years as the emission of 56 to 72 tons of CO₂. ReEngineered Feedstock therefore produces significant short-term environmental benefits by diverting MSW from the waste stream before it reaches a landfill. In doing so, ReEngineered Feedstock converts the biogenic carbon in MSW to CO₂ before that waste decays to produce the much more potent GHG, methane, while also generating usable energy and displacing fossil fuel CO₂.

C. ReEngineered Feedstock Can Address the Inefficiency of Landfill Gas-To-Energy Projects by Harnessing the Energy Potential of MSW that Is Not Captured by Those Systems

Landfill gas collection and capture efficiency is a measure of the amount of LFG that is collected relative to the amount produced by a particular landfill. EPA, along with state and local regulators, often utilizes assumed gas collection efficiencies to calculate landfill emissions for regulatory and other purposes.²⁴ EPA has developed a conservative default collection and capture efficiency for landfills employing LFG capture technologies of 75 percent (from a range of 60 to 85 percent) based on its review of the literature and comparable estimates utilized by practitioners in the LFG industry.²⁵ Although the actual capture rate of a particular landfill depends on certain site-specific considerations, including the type of cover system and LFG collection system employed by the landfill, the estimated default collection and capture efficiencies illustrate that landfills are not able to utilize 100 percent of the LFG they produce. As a result, despite LFG capture and gas-to-energy projects, landfills in the United States continue to release substantial amounts of GHGs to the atmosphere. ReEngineered Feedstock can alleviate this pressure on the environment by using MSW as an input to its process, displacing emissions from fossil fuels such as coal, and ultimately reducing the volume of waste that reaches landfills.

ReEngineered Feedstock can address the inefficiency of landfill gas-to-energy projects by harnessing the energy potential of MSW that is not captured by those systems. Of the methane captured at landfills in the United States, roughly half is flared, while the other half is converted to energy. Flaring captured LFG simply converts CH₄ to CO₂ without utilizing any of the underlying MSW's energy potential. ReEngineered Feedstock – when used as a fuel by coal-fired power plants and industrial boilers – reduces greenhouse gas emissions by avoiding methane gas emissions from landfills and by unlocking the energy potential of the underlying MSW, allowing power plants and industrial boilers to rely less on fossil fuels. With landfill gas-to-energy projects: 1) the fossil fuel portion of MSW (*e.g.*, plastics) will remain in the landfill and will not be converted to LFG; 2) the capture rate for the LFG, generated by organic fraction of the MSW, is well below 100 percent; and 3) currently only roughly half of the methane gas captured is converted to energy. In contrast, ReEngineered Feedstock can utilize all the energy potential of the MSW, and can provide greater reductions of GHGs than landfill gas collection and capture technologies on their own.

²³ *Id.*

²⁴ Sullivan at 7.

²⁵ *Id.*

D. ReEngineered Feedstock Produces the Same Environmental and Economic Benefits as the Landfill Gas-To-Energy Projects Endorsed by EPA's Landfill Methane Outreach Program and Provides Additional Benefits

EPA encourages recovery and use of landfill gas as an energy resource through its Landfill Methane Outreach Program (LMOP). In doing so, the Agency has touted the environmental benefits of utilizing MSW as a reliable and renewable fuel option that remains largely untapped across the United States, despite its many benefits. Each of the benefits the Agency highlights for landfill gas-to-energy projects also applies to the combustion of ReEngineered Feedstock in coal-fired power plants and industrial boilers.

Like landfill gas-to-energy projects, ReEngineered Feedstock helps to avoid generation of methane – a potent heat-trapping gas over 21 times more harmful than CO₂ – by reducing the amount of MSW that ends up in landfills.²⁶ As mentioned previously, MSW landfills are the third-largest human-generated source of methane emissions in the United States, contributing an estimated 27.5 million metric tons of carbon equivalent to the atmosphere in 2009 alone.²⁷ ReCommunity's focus on a zero-landfill future has led it to invest in and develop technology that would allow an ever-increasing portion of the current material destined for landfills to be recycled or reused. The ReEngineered Feedstock process begins by significantly increasing the percentage of a community's waste stream that is recycled (by between 20% and 60%). ReCommunity then uses the remaining materials, except for the 10 to 15% that are inert, prohibitive, or otherwise noncombustible, to capture and reuse between 85 and 90% of the current municipal waste stream. This process has the ultimate effect of reducing GHG emissions directly by avoiding the release of CH₄ from landfilled MSW.

In addition, as discussed in the next section, ReEngineered Feedstock indirectly reduces air pollution and GHG emissions by lowering the use of non-renewable resources such as coal. ReEngineered Feedstock also dramatically reduces the costs associated with such air emission reductions, namely the capital costs associated with installing nitrous oxide (NO_x) controls or flue gas desulfurization technology for coal-fired power plants. This fact is of special significance for smaller plants where the capital costs of compliance technologies are significantly higher on a per-kilowatt basis.

Further, ReEngineered Feedstock minimizes landfilling and significantly reduces capital investment associated with LFG collection, and landfill gas-to-energy plants, as well as leachate collection and treatment. In short, ReEngineered Feedstock offers a cost-effective option for reducing CH₄ emissions while generating electricity and otherwise maintaining environmental compliance.

²⁶ See Section III.B, above, regarding the potency of methane over various timeframes.

²⁷ U.S. ENVIRONMENTAL PROTECTION AGENCY, Landfill Methane Outreach Program Homepage, available at <http://www.epa.gov/lmop/basic-info/index.html>.

IV. THE FOSSIL FUEL PORTION OF ReENGINEERED FEEDSTOCK ALSO PROVIDES POSITIVE GHG BENEFITS

As noted above, ReEngineered Feedstock is made from both biogenic fibers and plastics separated from MSW and other wastes. Prior to addition of virgin sorbents, approximately 70% of the materials used to make ReEngineered Feedstock are biogenic.²⁸ Plastics are included in ReEngineered Feedstock specifically to increase the effectiveness of ReEngineered Feedstock as a control technology when co-fired with coal.

The BCE Panel’s draft report recommends that the EPA Accounting Framework “take into account the mix of biogenic waste with fossil carbon containing waste since the combustion of municipal solid waste results in the production of both biogenic and fossil carbon.”²⁹ ReCommunity notes, however, that the fossil fuel portion of ReEngineered Feedstock provides for GHG reductions beyond simply substituting for coal that otherwise would be combusted and avoiding the emissions associated with coal mining. The non-biogenic content of ReEngineered Feedstock allows more efficient operation of the coal-fired boiler and likely also has a life-cycle emissions factor that is less than coal. As a result, the emissions from the non-biogenic component of the ReEngineered Feedstock should be appropriately discounted.

ReEngineered Fuel contains sorbents targeted to significantly reduce emissions of conventional pollutants such as NO_x and sulfur dioxide (SO₂) when it is co-fired with coal. The plastic content of ReEngineered Feedstock is essential to delivering the sorbent at the optimal time and temperature zones to maximize their effectiveness. Typical sorbent-injection technologies face two effectiveness issues: if injected at the initial stage of the boiler, the high temperatures can reduce the effectiveness of the sorbent to as low as 20%; and if injected at the optimal temperature, the sorbent is not evenly distributed across the coal profile, reducing its effectiveness. The plastic in ReEngineered Feedstock provides a “coating” that protects the sorbent from initial high temperatures in the boiler. The plastic content also allows the ReEngineered Feedstock to be fluid-dynamically similar to coal, allowing direct co-firing so that, when the sorbent reaches the optimal temperature zone, it is evenly distributed across the coal profile, thus maximizing effectiveness.³⁰ In addition, the plastic content boosts the ReEngineered Feedstock’s energy content to be similar to that of coal (prior to sorbent addition).

For these reasons, the plastic content allows ReEngineered Feedstock to be a successful substitute for conventional emissions control technology. ReEngineered Feedstock therefore reduces the energy penalty associated with traditional emissions controls such as flue-gas desulfurization (FGD), which requires significant energy and water usage to operate. The energy efficiency penalty from an FGD unit can be 2-3% of a plant’s output. These improvements should be included with ReEngineered Feedstock’s life-cycle calculations, and, given the central role of the plastic content to the emissions control aspect of ReEngineered Feedstock, they should be attributed to the non-biogenic content of ReEngineered Feedstock.

²⁸ ReCommunity uses mass balance and carbon-14 testing to determine the biogenic content of ReEngineered Feedstock.

²⁹ Draft BCE Panel Report at 18.

³⁰ See Appendix A of the March 16 comments for additional information on the ReEngineered Feedstock sorbent technology.

Material production GHG emissions associated with ReEngineered Feedstock, including the plastic portion of the Feedstock, are limited as compared with coal mining, which is a heavily energy-intensive process. (As discussed in Section II, above, emissions from manufacture of the plastic items should not be counted, as those items were not produced for energy purposes.) Transportation of the plastic content to a ReCommunity facility is an “anyway” emission, as the waste otherwise would have been transported to a landfill. In fact, for most coal-fired facilities, the transportation from the ReCommunity facility to the boiler is likely to be shorter than transportation of coal, as ReCommunity is establishing relationships with municipalities for both their waste contracts and municipal boilers, eliminating the need for transportation over long distances. Further, to the extent MSW or other waste would have been incinerated without energy recovery, the plastics would contribute GHG emissions to the atmosphere without offsetting emissions from coal-fired boilers.

Thus, the overall greenhouse gas emissions impacts from ReEngineered Feedstock are less than the non-biogenic direct emissions, given the numerous benefits when compared to coal combustion. The next section illustrates that even the non-biogenic portion of ReEngineered Feedstock likely reduces greenhouse gas emissions compared to coal combustion. As recognized by the BCE Panel, these overall low impacts should allow a low or zero biogenic factor to be applied to ReEngineered Feedstock.³¹ ReCommunity believes that, in conjunction with the other benefits of ReEngineered Feedstock and the need to provide a framework that incentivizes use of materials like ReEngineered Feedstock, the GHG benefits afforded by the fossil portion of the Feedstock may justify assigning a BAF of 0 to the entire content of ReEngineered Feedstock.

V. COMPARATIVE SCENARIOS DEMONSTRATE THE GHG BENEFITS OF ReENGINEERED FEEDSTOCK

ReCommunity is in the process of conducting a full-scale life cycle analysis for ReEngineered Feedstock. While that analysis will provide more refined calculations, ReCommunity provides here two simplified scenarios to give some context for the comparative benefits of ReEngineered Feedstock. These scenarios are illustrative, and should not be treated as a complete life-cycle analysis.

The first scenario (Scenario A) is a business-as-usual-case estimate of emissions from 100 mmBTU-worth of typical municipal solid waste, and is based on a run of EPA’s Landfill Gas Emissions Model (LandGEM) with default values. The second (Scenario B) is an estimate of emissions resulting from 100 mmBTU of municipal solid waste processed into ReEngineered Feedstock.³² Since 90% of methane emissions are generated from wastes less than 30 years old, we have assumed a thirty-year time frame.³³

³¹ 5-9 Draft BCE Panel Report at 13.

³² For the estimate, some smaller contributors to emissions which are not yet available, such as process energy and transportation to the combustion facility, were not included, but are not expected to be major contributors to the overall GHG footprint. Estimates of such emissions will be included in the full-scale manufacturing life cycle analysis ReCommunity is developing.

³³ See GHG Inventory at A-326.

For each scenario, we have tracked emissions from a starting amount of MSW materials representing 100 mmBTU. We have assumed 218.9 lbs CO₂ for every mmBTU of MSW combusted, 205 lbs CO₂ for every mmBTU of coal combusted, 117.1 lbs CO₂ for every mmBTU of methane combusted, and 176.8 for every mmBTU of ReEngineered Feedstock. We also have assigned methane a CO₂ equivalency factor of 40 (*i.e.*, 1 lb CH₄ = 40 lbs CO₂e) given the relatively short time frame (see discussion of the impacts of time on methane emissions factors above in Section III.B). Methane recovery estimates for Scenario A are national averages from the Greenhouse Inventory. Note that for purposes of this illustration we have counted biogenic CO₂ emissions, but for the reasons above believe that those emissions should not be counted for purposes of Clean Air Act permitting.

Table 2 lays out the comparison of GHG emissions under the two scenarios. These estimates, while simplified, nevertheless indicate that use of ReEngineered Feedstock provides significant GHG reductions over landfilling of the waste, even with use of methane capture technology at the landfill. All of the emissions due to ReEngineered Feedstock combustion displace emissions that otherwise would come from combustion of coal. In contrast, only a small portion of landfill GHG emissions displaces fossil fuel emissions.

Scenario A – Business As Usual

Of the 100 mmBTU of MSW, the majority will stay put in some form. However, in addition to the approximately 10% of the MSW that is currently incinerated on a national basis, significant emissions are seen from decay within the landfill. As can be seen above in Table 2, the emissions associated with methane are significant from a greenhouse gas perspective, particularly in the short term. As discussed above in Section III.B, methane emissions factors for 20 years are estimated at 56-72 times the impact of CO₂, so ReCommunity here estimates a value of 40 for thirty years. Also of note is the very small amount of emissions that result in the capture of useful energy, 5.2 mmBTU.

Under Scenario A, over 14,300 lbs of CO₂e are emitted over 30 years, based on EPA's LandGEM model and average values from the Greenhouse Inventory. Almost all of these emissions are not displacing emissions from fossil fuels.

Scenario B – ReEngineered Feedstock

In contrast, ReEngineered Feedstock captures almost all of the usable or combustible material within MSW. First, the ReEngineered Feedstock process removes approximately 15% of the material in MSW for recycling, above the approximately 26% removed by traditional source recycling. In addition to reducing direct CO₂ and methane emissions from decay, this has the added benefit of reducing emissions from material production and generation, which, based on EPA's emission Factors in the WARM model, are quite significant, displacing over 10,000 lbs of CO₂e. ReCommunity separates out combustible materials with potentially damaging emissions profiles, such as PVC, although this is a relatively small component of overall MSW heat content—conservatively 5%. Of the remaining material, ReCommunity's ReEngineered Feedstock process would allow 100% combustion for energy recovery. Of the 80 mmBTU remaining, this would generate 14,144 lbs of CO₂ emissions, of which approximately 60% are biogenic, directly displacing fossil CO₂ emissions from coal with biogenic emissions.

Overall, ReEngineered Feedstock use dramatically reduces CO₂ emissions, primarily from reduced methane generation and reduced coal consumption. In Scenario B, total CO₂e emissions are estimated to be 14,144 lbs CO₂e; but the overall ReEngineered Feedstock process displaces over 28,000 lbs of fossil CO₂ in emissions, due to reduced production of raw material for recyclables, reduced energy use for emissions control devices, and direct displacement of coal in the boiler. Because of the biogenic portion of ReEngineered Feedstock, and the significant benefits associated with recycling, ReEngineered Feedstock can dramatically reduce actual emissions when compared with current practice in the United States. While these scenarios are not a full-scale life cycle analysis, and should not be treated as such, they are strongly indicative of a zero or negative emissions factor for ReEngineered Feedstock.

Table 2. Comparative Greenhouse Gas Emissions Scenarios

	A. Business As Usual		B. ReEngineered Feedstock	
	Description	Energy and Emissions	Description	Energy and Emissions
1	Initial amount of combustible material	100 mmBTU	Initial amount of combustible material	100 mmBTU
2	Incinerated	10% incinerated ³⁴ , 2,189 lbs CO ₂ emitted ³⁵	Instead, an additional 15% of the combustible content is recycled, reducing CO ₂ emissions from virgin material production	-10,267 lbs CO ₂ ³⁶
3	LandGEM estimated methane emissions from decay	758 lbs methane generated	No decay of Feedstock materials, but prohibitives removed	-5 mmBTU PVC, etc.
4	LandGEM estimated CO ₂ emissions from decay	2,084 lbs CO ₂ emitted		

³⁴ See GHG Inventory at 3-38.

³⁵ Calculated based on data from EPA's AP-42 Fifth Edition. See EPA, Compilation of Air Pollutant Emission Factors, p. 2.1-24 (Jan. 1995).

³⁶ Assumes equal BTU values for recyclable/non-recyclables. Calculation based on EPA's WARM emissions factor for mixed recyclables of -2.8 MTCO₂E per short ton of MSW.

	A. Business As Usual		B. ReEngineered Feedstock	
5	60% of methane is captured ³⁷	303 lbs methane uncaptured, of which 10% is oxidized to CO ₂ by soil cover, the rest released, for a <i>total of 10,915 lbs CO₂e and 81.4 lbs CO₂</i>	Direct combustion results in CO ₂ emissions	<i>14,144 lbs CO₂ emitted</i> , of which 8,486 lbs are biogenic
6	Of captured methane, half is combusted for energy recovery, half flared ³⁸	5.2 mmBTU used for energy generation, which <i>emits 610 lbs direct CO₂ emissions</i> 5.2 mmBTU flared, <i>emits 610 lbs direct CO₂ emissions</i>		
7	Displaced and reduced fossil emissions	Only 5.2 mmBTU captured for use, displacing natural gas emissions <i>-610 lbs CO₂</i>	20% coal displaced, and compared to traditional emissions control, mmBTU required reduced by 2%	80 mmBTU captured for energy use, displacing coal <i>-16,400 lbs CO₂</i> , <i>-1,640 lbs CO₂</i> due to reduced emissions control loads
8	Total Emissions:	3386 lbs biogenic CO ₂ emissions – only 610 lbs displacing fossil emissions 10,915 lbs CO ₂ e methane emissions <i>(continued next page)</i>	Total Emissions:	8,486 lbs biogenic CO ₂ emissions – all displacing fossil emissions 7,200 lbs non-biogenic CO ₂ emissions 0 methane related emissions Non-biogenic emissions reductions of 28,307 due to increased recycling and reduced coal plant load. <i>(continued next page)</i>

³⁷ See GHG Inventory at 8-4.

³⁸ *Id.*

	A. Business As Usual		B. ReEngineered Feedstock	
		Total of 14,301 lbs CO₂e emitted 610 lbs CO₂e displacing fossil emissions 13,691 lbs CO₂e not displacing fossil emissions		Total of 14,144 lbs CO₂e emitted 28,307 lbs CO₂e displacing fossil emissions 0 lbs CO₂e not displacing fossil emissions

CONCLUSION

As described in ReCommunity's March 16 comments and herein, ReEngineered Feedstock provides numerous environmental and community benefits, including GHG reductions, reductions in other pollutants from coal-fired boilers, reduced landfilling, and beneficial community partnerships. ReCommunity endorses the BCE Panel's recommendation that, for low impact feedstocks, EPA weigh ease of implementation against scientific accuracy, and that a low or zero BAF could be assigned to such feedstocks. For the reasons given in the March 16 comments and herein, ReCommunity believes that a BAF of 0 is well justified for Reengineered Feedstock.